1983 ANNUAL REPORT ON AIR QUALITY IN THE STATE OF MAINE

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1. INTRODUCTION

1.1 Purpose and Overview

The purpose of this report is to present the air quality monitoring data generated by and for the Maine Department of Environmental Protection, Bureau of Air Quality Control, and to provide a historical perspective from which the significance of that data can be interpreted. Air Quality monitoring measures the concentrations of various pollutants in the ambient air. The monitoring is in response to State and Federal requirements to determine whether the air we breathe is attaining and maintaining National and State Ambient Air Quality Standards which are designed to protect the health and welfare of the public. Federal Primary Standards are intended to protect public health. Federal Secondary Standards are intended to protect public welfare. The State Standards are at least as strict as Federal Standards and in some cases are more strict. The reasoning behind establishing more stringent standards is that generally air quality in Maine is significantly cleaner than in other areas and should remain cleaner. The current Federal and State Standards are presented in Tables 1-1 and 1-2. Table 1-3 is a summary indicating all the violations of ambient air quality standards in the State by regions. Later on in this report those violations will be listed by the sites at which they occurred.

The majority of data now collected in the State is collected by industry. The Department has required industry to establish monitoring programs primarily when there are air quality problems associated with the industry, or when an industry is planning to build or expand causing a potential increase in air emissions. The State is still collecting monitoring data for long term trends, special studies and for compliance determinations. Ambient air monitoring by both industry and the State will continue in various regions where necessary until such time as standards are being met.

Included in this section are some figures which depict some of the results of air quality monitoring and control in the State. Figures 1-1 through 1-4 display trends or the lack of a trend which have been occurring at several long term key sites around the State.

Figure 1-1, which depicts the annual geometric means for total suspended particulates, generally shows improvements at all sites with the exception of Presque Isle. Presque Isle continues to have extremely elevated concentrations and will require further control measures to achieve the standards. Most of the improvements shown at sites other than Presque Isle have been due to control programs which have been implemented over the last few years.

Figure 1-2 indicates the sulfur dioxide trends at three sites with a long term history. Millinocket, which was declared a non-attainment area in 1979, has shown a steady decline in the annual average due to control measures and process changes. Consequently, the State has made a change in the designation of Millinocket to attainment for sulfur dioxide. Madawaska appears to have made improvements over the last year while Portland appears to be maintaining a fairly constant level of sulfur dioxide over the last three years.

TABLE 1-1

NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Concentration
Particulates (TSP)	Annual Geometric Mean:	
	Primary	75 ug/m^3
	Secondary	60 ug/m^3*
	Twenty-Four Hour:**	
	Primary	260 ug/m^3
	Secondary	150 ug/m^3
Lead (Pb)	Calendar Quarter	1.5 ug/m^3
Carbon Monoxide (CO)	One Hour**	35 ppm
	Eight Hour**	9 ppm
Ozone (O_3)	One Hour***	0.12 ppm
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.05 ppm
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	0.03 ppm
	Twenty-Four Hour**	0.14 ppm
	Three-Hour**	
	Secondary	0.50 ppm
Hydrocarbon	Three Hour**	160 ug/m^3

* = Federal Guideline Only.
** = Not to be exceeded more than once per year.
*** = Statistically estimated number of days with exceedances is not to be more than 1 per year.
ppm = Parts of pollutant per million parts of air.
ug/m^3 = Micrograms of pollutant per cubic meter of air.

TABLE 1-2

STATE OF MAINE AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Concentration
Particulates (TSP)	Annual Geometric Mean	60 ug/m^3
	Twenty-Four Hour	150 ug/m^3
Lead (Pb)	Twenty-Four Hour*	1.5 ug/m^3
Carbon Monoxide (CO)	One Hour*	35 ppm(40 mg/m^3)
	Eight Hour*	9 ppm(10 mg/m^3)
Ozone (O_3)	One Hour*	.08 ppm(160 ug/m^3)
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	.053 ppm(100 ug/m^3)
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	.022 ppm(57 ug/m^3)
	Twenty-Four Hour	.088 ppm(230 ug/m^3)
	Three Hour	.439 ppm(1150 ug/m^3)
Hydrocarbon	Three Hour*	160 ug/m^3

* = Not to be exceeded more than once per year.
PPM = Parts of pollutant per million parts of air.
ug/m^3 = Micrograms of pollutant per cubic meter of air.
mg/m^3 = Milligrams of pollutant per cubic meter of air.

TABLE 1-3

NUMBER OF AMBIENT AIR QUALITY VIOLATIONS BY REGIONS

POLLUTANT	REGIONS* 107	108	109	110	TOTALS
Total Suspended Particulates					
Annual Geometric Mean**					
State	0	1	0	0	1
Federal	0	0	0	0	0
Twenty-four Hour					
State	20	24	37	2	83
Federal	0	3	2	0	5
Lead					
Twenty-four Hour					
State	0	0	0	0	0
Federal	0	0	0	0	0
Carbon Monoxide					
One Hour	n/a	n/a	0	n/a	0
Eight Hour	n/a	n/a	0	n/a	0
Ozone					
One Hour					
State	101	n/a	217	395	713
Days					
Federal	2	n/a	2	16	20
Nitrogen Dioxide					
Annual Arithmetic Mean	n/a	n/a	n/a	0	0
Sulfur Dioxide					
Annual Arithmetic Mean					
State	0	0	0	0	0
Federal	0	0	0	0	0
Twenty-four Hour					
State	0	2	0	0	2
Federal	0	0	0	0	0
Three Hour					
State	0	0	0	0	0
Federal	0	0	0	0	0

*Region 111 has not been included because there was no monitoring in this region during 1983.

**Annual Means generated by only a few samples are not included in this summary.

FIGURE 1 - 1
FIVE YEAR TREND - TOTAL SUSPENDED PARTICULATES

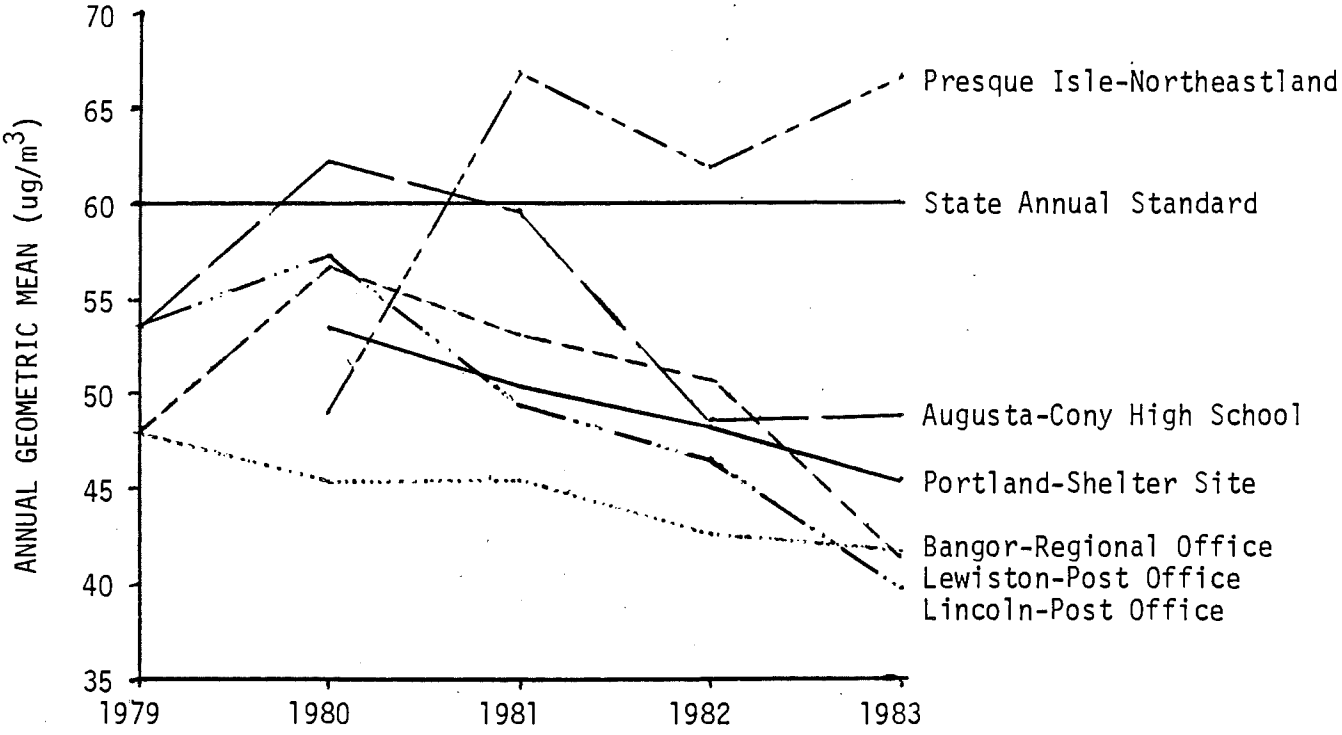

FIGURE 1 - 2
FIVE YEAR TREND - SULFUR DIOXIDE

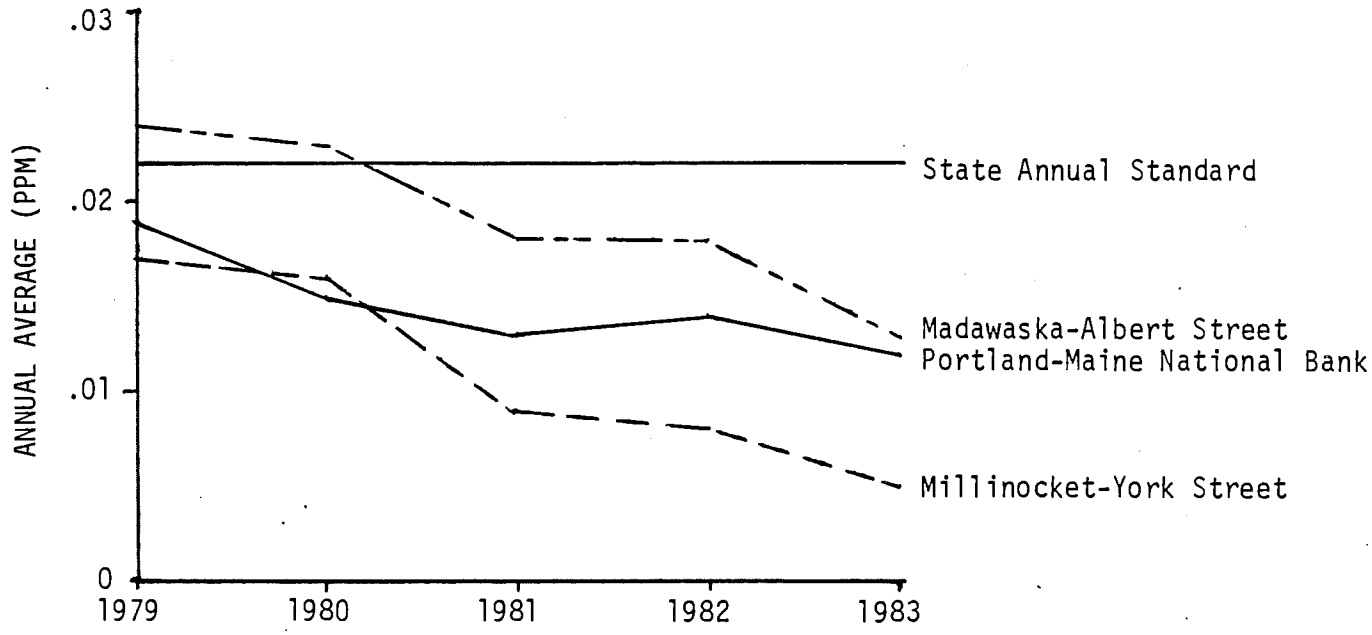

FIGURE 1 - 3
FIVE YEAR TREND - CARBON MONOXIDE

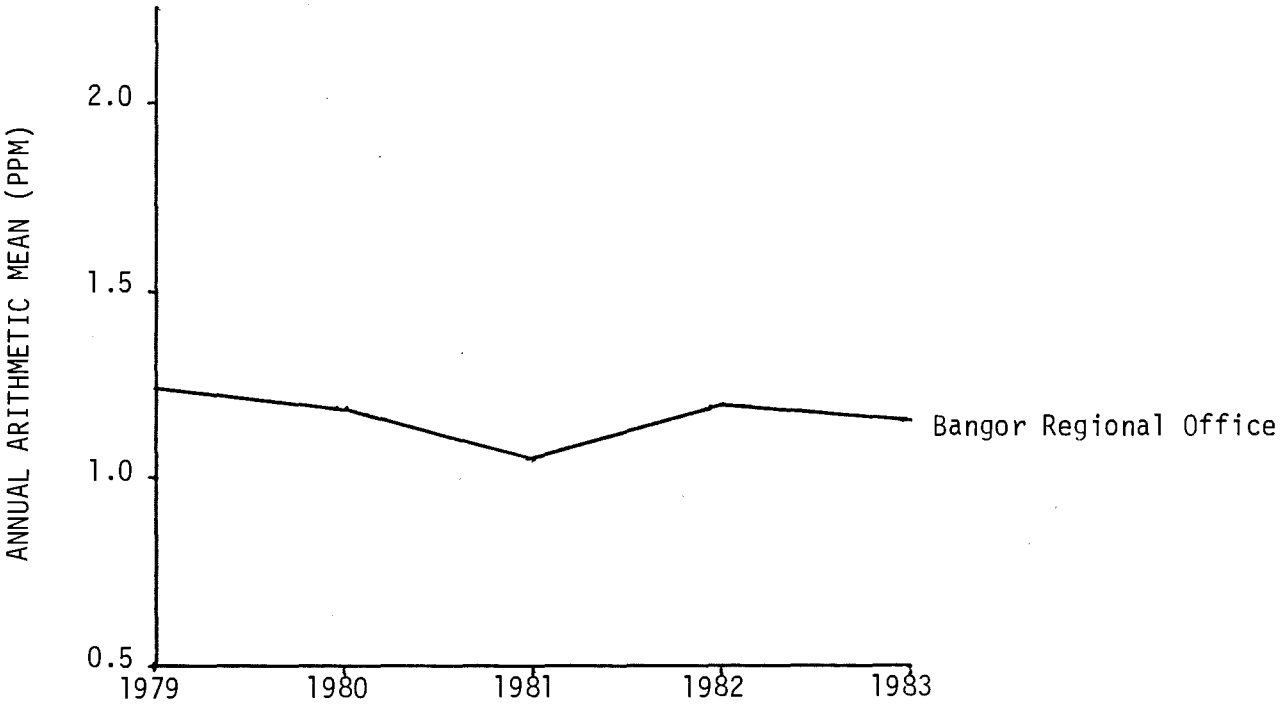

FIGURE 1 - 4
FIVE YEAR TREND - OZONE

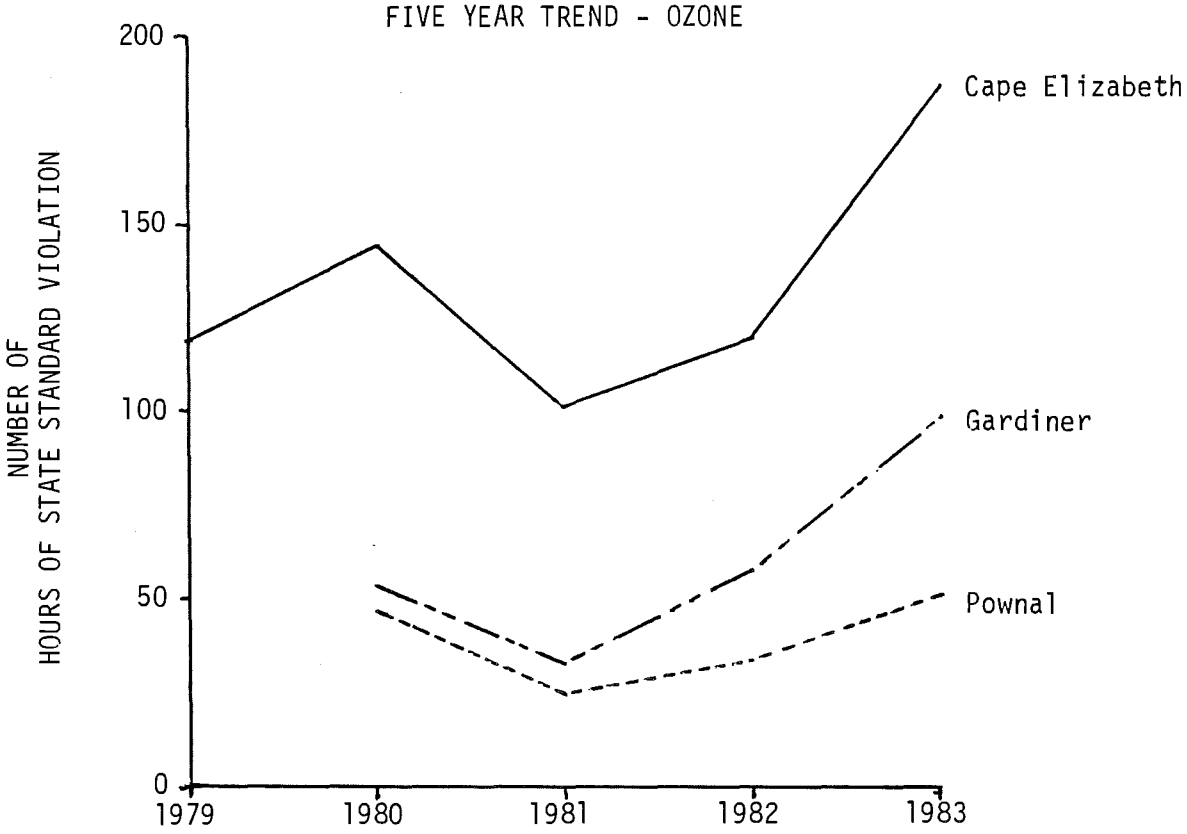

Figure 1-3 for carbon monoxide shows a very constant level since 1979. Consequently, the State has redesignated Bangor, which was designated as non-attainment for carbon monoxide in 1979 due to violations in previous years, to attainment for carbon monoxide. It should be pointed out that this graph depicts annual averages whereas the carbon monoxide standards are for one hour and eight hour time periods.

Figure 1-4 depicts the number of hourly violations of the State ozone standard. As can be seen from the graphs, all three of the sites showed dramatic increases in the numbers of violations which occurred in 1983. While there is certainly a cause for concern the increase may not be as exceptional as one might think when looking at the graphs since ozone is very dependant upon meteorological conditions and because of that the number of violations recorded each year can be quite variable.

Data summarized in this report is available for review in the Department headquarters in Augusta and copies can be obtained from that office for a nominal fee.

1.2 Monitoring Sites

Air quality data are developed using two basic methods; 1) the continuous monitoring of gaseous pollutants and; 2) the periodic sampling of particulate and gaseous pollutants. In addition to pollutant monitoring there is also the continuous monitoring of meteorological parameters.

Continuous gaseous monitoring is done at forty-five sites in Maine. Carbon Monoxide is monitored at one of these stations, ozone at six, sulfur dioxide at thirty-eight, nitrogen oxides at one, and hydrocarbons at one.

Particulate sampling is done at seventy-three sites in Maine. All of these stations monitor total suspended particulates. Eight of these sites also collect fine particulate fractions. Also, lead monitoring is done at nine stations. Thirteen of these sites are analyzed for sulfates although not all of them are on a regular basis. There are also two sites collecting acid rain data which are part of the state monitoring network.

In addition to pollutant monitoring, wind speed and direction is recorded at twenty-three sites around the State. Some of these sites also record other meteorological parameters such as sigma (stability) and temperature, precipitation and solar radiation.

Table 1-4 presents all the monitoring sites in Maine and indicates which parameters are monitored at each site. The map in Figure 1-5 shows the Air Quality Control Regions within the State.

1.3 Document Organization

This document is divided by pollutant into chapters. Each chapter contains: 1) a description of the nature and sources of that pollutant, 2) its health and welfare effects, 3) a discussion on the standards (current and proposed) for that pollutant, 4) a discussion of the monitoring methods for that pollutant, 5) a table presenting the 1983 monitored data, 6) in the case of some pollutants, historical tables presenting 1983 data along with data for

TABLE 1 - 4
1983 AMBIENT AIR QUALITY MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	PARAMETERS MEASURED
ANDROSCOGGIN INTERSTATE AIR QUALITY CONTROL REGION (107)			
Auburn (0060 005)	Lewiston-Auburn Airport	DEP	WS/WD
Auburn (0060 008)	Lepage Bakery 60 Second Street	DEP	TSP
Auburn (DISC) (0060 009)	Woodbury Hill Woodbury Hill Road	New England Ethanol	SO_2
Auburn (DISC) (0060 010)	Martindale Country Club Beach Hill Road	New England Ethanol	SO_2
Augusta (0080 001)	Cony High School Cony Circle	DEP	TSP,Pb,Sulfate,FP
Augusta (0080 005)	Hartford Fire House Hartford Square	DEP	TSP
Augusta (0080 008)	Governor's Hangar State Airport	DEP	WS/WD
Gardiner (0460 001)	Gardiner High School West Hill Road	DEP	Ozone[s]
Jay (0530 001)	Weather Level I Lagoon Hill	International Paper	WS/WD,Temperature,Solar Radiation,Precipitation TSP,FP
Jay (0530 003)	Crash Road	International Paper	TSP
Jay (0530 004)	Jay Hill	International Paper	TSP,SO_2[d]
Jay (0530 005)	Bracketts Crash Road	International Paper	SO_2[d]
Jay (0530 006)	Water Treatment Plant International Paper	International Paper	SO_2[d]
Jay (0530 007)	Water Treatment Plant Site #2 International Paper	International Paper	TSP
Farmingdale (DISC) (0547 001)	4800 Northern Avenue	DEP	TSP,Sulfate,FP
Wayne (DISC) (0547 002)	Norton's Residence Fairbanks Road	DEP	TSP

TABLE 1 - 4
1983 AMBIENT AIR QUALITY MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	PARAMETERS MEASURED
Lewiston (0620 005)	Lewiston Post Office 49 Ash Street	DEP	TSP,Pb,Sulfate
Lewiston (0620 011)	Country Kitchen Parking Lot Canal Street	DEP	SO_2
Madison (DISC) (0740 001)	Madison Municipal Building Route #201	Madison Paper	TSP
Madison (DISC) (0740 002)	Coro Property Pine Street	Madison Paper	TSP
Madison (DISC) (0740 003)	Abenaki Mill Parking Lot Madison Paper	Madison Paper	WS/WD
Mexico (0760 003)	Mexico Treatment Plant Route #2	Boise Cascade	TSP,Sulfate
Mexico (0760 008)	Labonville's	Boise Cascade	TSP
Mexico (0760 010)	Carver's Residence Fourth Street	Boise Cascade	TSP,SO_2
Mexico (NEW) (0760 011)	Hunt's Route #2	Boise Cascade	SO_2
South Paris (0885 001)	Bessey Motors Railroad Street	Wilner Wood	TSP^S
South Paris (0885 004)	Reilly Property Gary Street	Wilner Wood	TSP^S
South Paris (0885 005)	Wilner Wood Weather	Wilner Wood	WS/WD^S
Canton (DISC) (0885 006)	Kennett's Property Cowhill Road	International Paper	WS/WD,Temperature,SO_2
Rockland (DISC) (1000 011)	Crocketts Point	FMC Corporation	WS/WD
Rockland (DISC) (1000 012)	Park Street Warehouse Park Street	FMC Corporation	SO_2
Rockland (DISC) (1000 013)	Benner Hill	Martin Marietta/Cianbro	SO_2
Rumford (1020 002)	Boise Cascade Weather II Swift River Pump House	Boise Cascade	WS/WD

TABLE 1 - 4
1983 AMBIENT AIR QUALITY MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	PARAMETERS MEASURED
Rumford (1020 005)	Taylor Mountain I	Boise Cascade	TSP,SO_2
Rumford (NEW) (1020 006)	Taylor Mountain II	Boise Cascade	TSP,SO_2
Rumford (NEW) (1020 007)	Village Green Site Route #108	DEP/Boise Cascade	TSP,SO_2
Skowhegan (1100 001)	Hinckley Hinckley School	S.D.Warren	TSP
Skowhegan (1100 002)	Eaton Ridge	S.D.Warren	TSP
Thomaston (1150 001)	Oexter Avenue	Martin Marietta/Cianbro	TSP,SO_2
Thomaston (1150 003)	Sanders Property Old County Road	Martin Marietta/Cianbro	TSP
Thomaston (1150 004)	Pease Property Buttermilk Lane	Martin Marietta/Cianbro	TSP
Thomaston (1150 005)	Martin Marietta Weather Route #1	Martin Marietta/Cianbro	WS/WD
Thomaston (1150 006)	Swamp Site	Martin Marietta/Cianbro	SO_2
Thomaston (1150 007)	Marsh Road	Martin Marietta/Cianbro	TSP,SO_2
Thomaston (1150 008)	Route #1	Martin Marietta/Cianbro	SO_2
Brooks (DISC) (1183 002)	Ryan Property Route #139	DEP	TSP
Waterville (1220 002)	Al Corey's Music Store Main Street	DEP	TSP
AROOSTOOK AIR QUALITY CONTROL REGION (108)			
Fort Kent (0420 001)	UMFK Pleasant Street	UMFK/DEP	WS/WD,TSP
Madawaska (0720 003)	Madawaska High School 7th Avenue	Fraser Paper/DEP	TSP,Pb,Sulfate,SO_2,FP^n

TABLE 1 - 4
1983 AMBIENT AIR QUALITY MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	PARAMETERS MEASURED
Madawaska (0720 006)	Fraser Paper Company Bridge Street	Fraser Paper	WS/WD,Temperature,Precipitation,Net Radiation
Madawaska (0720 009)	Albert Street	Fraser Paper	TSP[d],SO_2
Madawaska (0720 010)	Sewage Treatment Plant South Main Street	Fraser Paper	WS/WD,SO_2
Presque Isle (DISC) (0980 002)	Regional Office 634 Main Street	DEP	WS/WD
Presque Isle (DISC) (0980 003)	Presque Isle High School 16 Fort Street	DEP	TSP
Presque Isle (DISC) (0980 004)	Skyway School Skyway Street	DEP	TSP
Presque Isle (0980 005)	Northeastland Hotel 436 Main Street	DEP	TSP,Pb,Sulfate,FP[n]
Presque Isle (DISC) (0980 006)	Steego Auto Parts 5 Maple Street	DEP	TSP
Presque Isle (0980 007)	Creasey Ridge Road Lavaway Farm	DEP	TSP,Pb,Sulfate
Presque Isle (NEW) (0980 008)	Regional Office 528 Central Drive	DEP	WS/WD
DOWNEAST AIR QUALITY CONTROL REGION (109)			
Acadia National Park (0010 003)	McFarland Hill Ranger Station Route 233	NPS/DEP	Ozone,TSP,Sulfate,Acid Precipitation
Bangor (0100 001)	Regional Office 31 Central Street	DEP	TSP,Sulfate,CO[d]
Bangor (0100 002)	Kenduskeag Pump Station Washington Street	DEP	TSP,Pb,FP[d]
Bangor (DISC) (0100 005)	Bangor Daily News 491 Main Street	DEP	TSP
Bangor (0100 009)	BIA-Building #487 Air National Guard	DEP	WS/WD,TSP[d]
Brewer (DISC) (0130 001)	Brewer Fire Station South Main Street	DEP	TSP

TABLE 1 - 3
1983 AMBIENT AIR QUALITY MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	PARAMETERS MEASURED
Brewer (0180 002)	Brewer Junior High School 5 Somerset Street	DEP	TSP
Brewer (DISC) (0180 003)	Wastewater Treatment Plant South Main Street	DEP	TSP
East Millinocket (0315 002)	Katahdin School School Street	Great Northern Paper Company	TSP, Sulfate, SO_2
Deer Isle (0495 002)	Harrison Marshall Property Sunshine Road	DEP	Ozone[s], WS/WD[s]
Lincoln (0640 002)	Vocational Education Building West Broadway	Lincoln Pulp & Paper Company	TSP
Lincoln (0640 003)	Lincoln Post Office Building 50 Fleming Street	Lincoln Pulp & Paper Company	TSP, SO_2[d]
Lincoln (DISC) (0640 006)	Lincoln Town Garage Park Street	Lincoln Pulp & Paper Company	WS/WD
Lincoln (0640 007)	Thomas Motel Trailer Park 39 West Broadway	Lincoln Pulp & Paper Company	TSP, SO_2
Lincoln (0640 008)	Fish Hill Base	Lincoln Pulp & Paper Company	SO_2
Lincoln (NEW) (0640 009)	Fish Hill Peak	Lincoln Pulp & Paper Company	SO_2
Millinocket (0780 006)	Wastewater Treatment Plant Great Northern Paper Company	Great Northern Paper Company	SO_2
Millinocket (0780 009)	York Street	Great Northern Paper Company	TSP, SO_2, Sulfate
Millinocket (0780 011)	Great Northern Paper Co. Office	Great Northern Paper Company	WS/WD
Millinocket (0780 013)	East Avenue	Great Northern Paper Company	TSP[d], SO_2
Millinocket (DISC) (0780 014)	Municipal Wastewater Treatment Plant	Great Northern Paper Company	SO_2
Old Town (0840 003)	Marsh Island Apartments 100 South Main Street	DEP	TSP

TABLE 1 - 4
1983 AMBIENT AIR QUALITY MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	PARAMETERS MEASURED
Old Town (0840 005)	Penobscot Shoe Company 450 North Main Street	DEP	TSP
Newburgh (0907 005)	Newburgh School Route #9	DEP	TSP,FP[d]
Milford (0907 007)	Shumway Field Route #178	James River Corporation	TSP
Woodland (1205 004)	"O" Street	Georgia Pacific Corporation	TSP
Woodland (1205 006)	Georgia Pacific Mill	Georgia Pacific Corporation	WS/WD
Woodland (1205 007)	Secondary Treatment Pipeline	Georgia Pacific Corporation	TSP,SO_2
Woodland (1205 008)	Woodland High School	Georgia Pacific Corporation	TSP
Eastport (1205 014)	Pleasant Street	DEP	WS/WD
Woodland (1205 015)	Chip-N-Saw Waferboard Mill	Georgia Pacific Corporation	TSP
METROPOLITAN PORTLAND AIR QUALITY CONTROL REGION (110)			
Biddeford (0160 002)	Biddeford Treatment Plant Water Street	DEP	TSP,SO_2[d]
Bridgton (0190 002)	Upper Ridge Road	DEP	Acid Precipitation
Brunswick (DISC) (0200 001)	Coastal Savings Bank Maine Street	Brunswick Naval Air Station	TSP
Brunswick (DISC) (0200 002)	Naval Air Station Exchange	Brunswick Naval Air Station	TSP
Cape Elizabeth (0250 003)	Shelter Site Two Lights State Park	DEP	Ozone[s]
Pownal (0277 002)	Trailer Site Pownal Post Office	DEP	Ozone[s]
Kittery (0580 001)	Greenfield Drive	NH/OEP	TSP,Pb,Sulfate,SO_2

TABLE 1 - 4
1983 AMBIENT AIR QUALITY MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	PARAMETERS MEASURED
Kittery (NEW) (0580 002)	Wentworth Dennet School Government Street	NH/DEP	TSP
Kittery (NEW) (0580 003)	Masonic Temple Wallingford Square	NH/DEP	SO_2
Portland (DISC) (0960 008)	Maine National Bank Congress Street	DEP	SO_2
Portland (0960 010)	Chevrus High School Ocean Avenue	DEP	WS/WD
Portland (0960 014)	Shelter Site (P.E.O.P.L.) Elm Street	DEP	TSP, Pb, SO_2^n, NO_x^s, NO^s, $NMHC^s$, $Methane^s$
Portland (0960 015)	Tukey's Bridge Bean Pot Circle	DEP	Pb
Portland (DISC) (0960 016)	Mobil Station St. John's Street	DEP	TSP
South Portland (1140 002)	SMVTI Vocational Drive	DEP	TSP, Sulfate
Westbrook (1260 002)	N.E.T.&T. Company Ash Street	S.D. Warren	TSP
Westbrook (DISC) (1260 007)	Westbrook Police Department 419 Warren Avenue	DEP	TSP
Westbrook (1260 008)	Research Building S.D. Warren	S.D. Warren	TSP
Westbrook (1260 009)	S.D. Warren Company Wind S.D. Warren Property	S.D. Warren	WS/WD
Westbrook (DISC) (1260 010)	Westbrook Hospital 40 Park Road	S.D. Warren	TSP
Westbrook (DISC) (1260 011)	Park Road	S.D. Warren	TSP
Westbrook (1260 012)	S.D. Warren Warehouse #5 Main Street	S.D. Warren	TSP, SO_2^d, FP^n
Westbrook (DISC) (1260 013)	Duck Pond Road	S.D. Warren	SO_2

TABLE 1 - 4
1983 AMBIENT AIR QUALITY MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	PARAMETERS MEASURED
Yarmouth (DISC) (1300 001)	Cousins Island Meteorology	Central Maine Power Company	WS/WD
Kennebunkport (NEW) (1325 002)	Parson's Way	DEP	$Ozone^{s}$

NEW - Site established in 1983
DISC - Site discontinued in 1983

TSP - Total Suspended Particulates
SO_2 - Sulfur Dioxide
NO - Nitric Oxide
NO_x - Oxides of Nitrogen
CO - Carbon Monoxide
Pb - Lead
WS/WD - Wind Speed and Direction
FP - Fine Particulate
NMHC - Nonmethane Hydrocarbons

n - Instrument installed during 1983
d - Instrument removed during 1983
s - Instrument operated seasonally during 1983

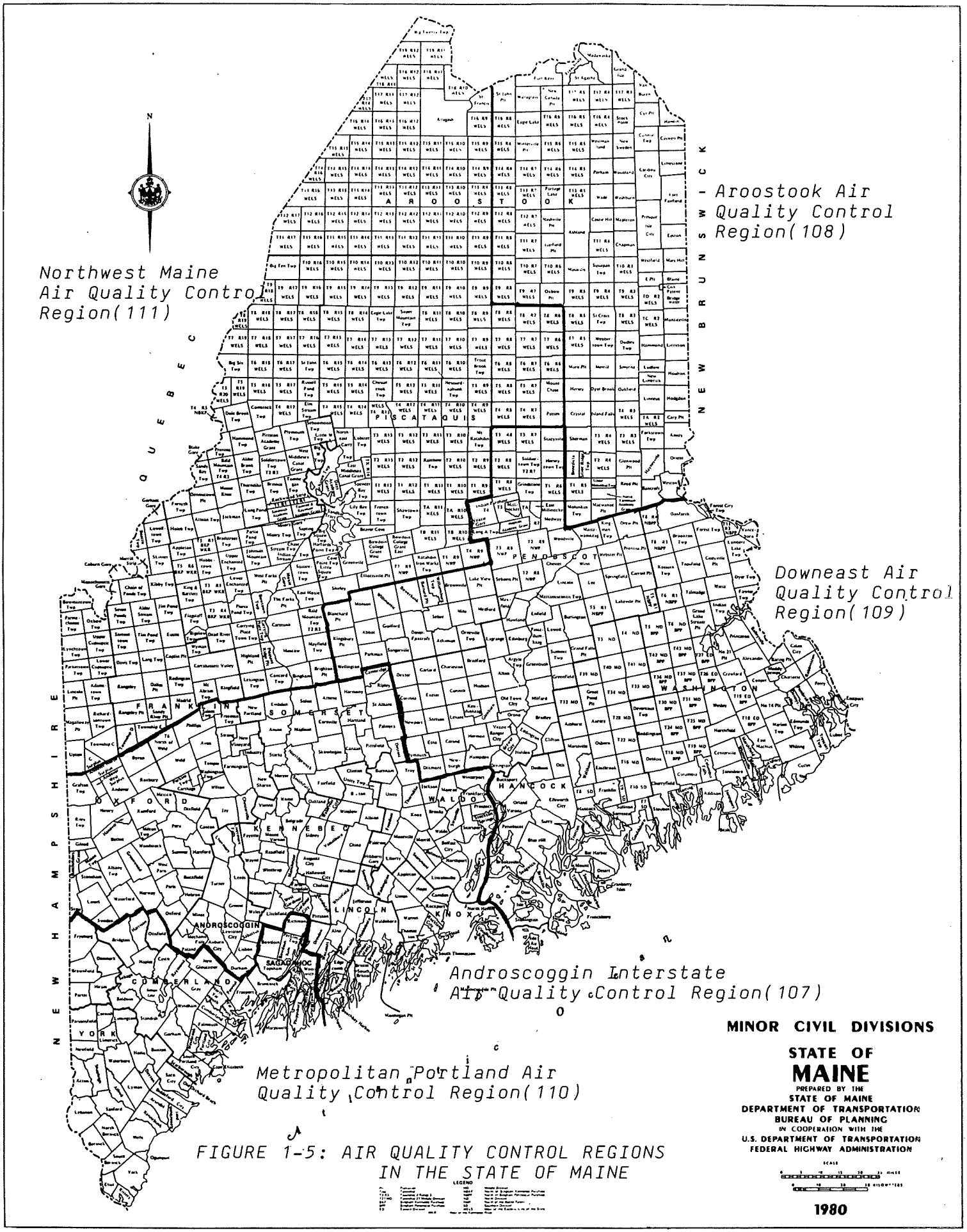

FIGURE 1-5: AIR QUALITY CONTROL REGIONS IN THE STATE OF MAINE

previous years to show trends, effects of control strategy, or change in emission sources.

1.3.1 Explanation of Data Summary Tables

The Data Summary Tables were designed to facilitate comparing 1983 air quality monitoring data with the standards for each pollutant. Therefore, the data are presented for each averaging time for which standards exist for a pollutant.

An annual average concentration is presented for each pollutant that has a long-term, annual standard (NO_2, SO_2, TSP).

For pollutants that have short-term standards, the highest or the highest and second highest short-term values are presented. Some pollutants are allowed to exceed the standard once during the year so the second highest value would be used to determine whether there was a violation or not.

All of the data collected during 1983 has been presented in the Data Summary Tables. However, in making comnparisons of the data, one should be aware that a site with only a few samples will not be a valid indicator of pollutant concentrations in the area.

1.3.2 Explanation of Historical Comparison Tables

The Historical Comparison Tables present air quality data for 1983 and those years prior to 1983 when the same pollutant was monitored at the same site. The purpose of the Tables are to indicate the variations in air quality from year to year. The Tables in some cases represent maximum concentrations for specific time periods and in others the number of days in each year that the standards were violated.

1.3.3 Explanation of Trends Tables

The highest hourly concentration in a year is not the best indicator of long-term air quality trends because it is an erratic value. Therefore, special trend tables are presented for carbon monoxide and ozone. The trend tables present the 10th, 50th, and 90th percentile values to represent the bulk of the air quality data for each year. Percentiles indicate the fraction, or percent, of the value that are below a particular level. For example, if the 90th percentile value for some set of CO observations is 5.0 ppm, it means that 90% of the time the concentrations of CO are less than 5.0 ppm. Conversely, it also means that 10% of the time the concentrations are above 5.0 ppm. Thus the existence or lack of long-term trends in overall air quality for CO and O_3 can be more reliably determined using the Trends Tables, than by looking at just the Historical Comparison Tables.

2. CARBON MONOXIDE (CO)

2.1 Description and Sources

Carbon monoxide is a colorless, odorless and tasteless gas. Therefore you do not even know you are breathing it until you feel its detrimental effects. It consititutes the largest single fraction of the pollutants found in urban atmospheres. It is produced primarily by the incomplete combustion of organic materials used as fuels for transportation and in the heating of buildings; it also results from industrial processes, refuse burning, and agricultural burning. Several natural sources of CO of both biological and non-biological origin have also been identified, but their contributions to urban atmospheric concentrations are thought to be small. Background levels of CO (resulting from natural and technological sources) found in relatively nonpolluted air range from 0.025 to 1.0 ppm. Urban carbon monoxide is produced primarily by motor vehicles.

Because motor vehicle traffic is the major source of CO, daily concentration peaks coincide with morning and evening rush hours. The worst carbon monoxide problems are found where large numbers of slow moving cars congregate. These problems are further aggravated when they occur in a "street canyon" situation. When there are large amounts of slow moving traffic in a street canyon situation, with the wind blowing perpendicular to the street, carbon monoxide can be trapped in the canyon and build up to unhealthful levels. Such has been the case in Bangor.

CO problems are usually worse in winter because: 1) cold weather makes motor vehicles run dirtier and requires more combustion for space heating; and 2) on winter nights a strong inversion layer develops in the atmosphere, that traps pollution near the ground, preventing it from mixing with cleaner air above.

2.2 Health and Welfare Effects

Carbon monoxide affects the central nervous system by depriving the body of the oxygen it needs. Tests of automobile drivers show exposure to carbon monoxide can impair a driver's judgement and ability to respond rapidly in traffic. It can also impair vision and produce headaches.

Carbon monoxide enters the bloodstream by combining with hemoglobin, the substance that carries oxygen to the cells. Hemoglobin that is bound up with CO is called carboxyhemoglobin. This combination occurs 200 times more readily with CO than with oxygen, so the amount of oxygen being distributed throughout the body by the bloodstream is reduced in CO's presence. Blood laden with CO can weaken heart contractions, lowering the volume of blood distributed to various parts of the body. It can also significantly reduce a healthy person's ability to perform manual tasks, such as working, jogging and walking. A life-threatening situation exists in patients with heart disease, who can't compensate for the oxygen loss. The 4.2 million people in the U.S. suffering from angina pectoris (a heart disease characterized by brief spasmodic attacks of chest pain due to insufficient oxygen levels in the heart muscles) are especially susceptible. Carbon monoxide is also harmful to persons who have

lung disease, anemia or cerebral-vascular disease. Others sensitive to carbon monoxide include the human fetus, and people exposed to long-term concentrations, such as traffic officers.

People who sit in idling cars over sustained periods risk harmful CO exposure, as do cigarette smokers. Since about two percent of cigarette smoke is carbon monoxide, if you or someone else smokes while driving in heavy traffic, you may both experience the harmful effects of CO from the cigarette smoke and the engine exhaust accumulated in streets. Even three or four hours after you're exposed, half the excess CO still remains in your bloodstream. Because it takes time for CO to build up in the bloodstream, the severity of health effects depends both on the concentration being breathed and the length of time the person is exposed.

2.3 Standards

The existing standards for carbon monoxide are currently set at 9 parts CO per million parts air (ppm), averaged over a period of 8 hours, and 35 ppm averaged over 1 hour, not to be exceeded more than once per year. As a result of a review and revision of the health criteria, EPA proposes to retain the existing primary 8-hour standard at 9 ppm and to lower the primary 1-hour standard to 25 ppm. The change in the 1-hour standard is being proposed because of the more rapid accumulation of blood carboxyhemoglobin in moderately exercising sensitive persons compared to resting individuals. The impact of exercise, which is greater for short-duration exposures, was not considered in the original standard.

2.4 Monitoring

Carbon monoxide was monitored at one site in Maine during 1983 using continuous monitoring equipment utilizing the non-dispersive infrared technique.

Table 2-1 is the 1983 Data Summary for CO. Table 2-2 presents the CO Historical Comparison and Table 2-3 presents the CO trends.

TABLE 2 - 1
1983 CARBON MONOXIDE DATA SUMMARY
(Parts Per Million)

SITE	ADDRESS	NUMBER OF OBSERVATIONS	1-HOUR CONCENTRATIONS HIGHEST	1-HOUR CONCENTRATIONS SECOND HIGHEST	8-HOUR CONCENTRATIONS HIGHEST	8-HOUR CONCENTRATIONS SECOND HIGHEST	ANNUAL ARITHMETIC MEAN
DOWNEAST AIR QUALITY CONTROL REGION (109)							
Bangor	Regional Office	8657	10.7	10.5	7.6	7.0	1.1

TABLE 2 - 2
CARBON MONOXIDE HISTORICAL COMPARISONS
Bangor - Regional Office

YEAR	SECOND HIGH*	# OF VIOLATIONS
1974	20.9 PPM	46
1975	14.6 PPM	48
1976	12.9 PPM	25
1977	13.7 PPM	24
1978	11.8 PPM	8
1979	6.2 PPM	0
1980	8.2 PPM	0
1981	7.2 PPM	0
1982	6.1 PPM	0
1983	7.0 PPM	0

* Eight hour concentrations.

TABLE 2 - 3
CARBON MONOXIDE TRENDS
Bangor - Regional Office

YEAR	PERCENTILES* 10%	50%	90%
1978	0.0	1.3	5.2
1979	0.0	0.5	3.0
1980	0.0	0.5	3.2
1981	0.0	0.5	2.7
1982	0.0	0.7	2.8
1983	0.0	0.7	2.8

* Percentiles are one hour concentrations in ppm.

3. OZONE (O_3)

3.1 Description and Sources

Ozone is a highly reactive form of oxygen which, at very high concentrations, is a blue unstable gas that has a characteristic pungent odor most commonly identified around an arcing electric motor, lightning storms, or other electrical discharges. However, at normal ambient concentrations, ozone is colorless and odorless. Ozone is the major component of photochemical "smog", but the haziness and odors of smog are primarily caused by other components.

Natural ground level ozone occurs in low concentrations (less than .05 ppm) due to natural physical and chemical phenomena. Occasionally, unique meteorological conditions can result in natural levels between .05 and .10 ppm.

Ozone is not emitted directly from a source as are other pollutants. It forms as a secondary pollutant. Its precursors are hydrocarbons and nitrogen oxides, which chemically react in sunlight to form ozone. The hydrocarbons are emitted in automobile exhaust, from gasoline and oil storage and transfer, and from industrial use of paint solvents, degreasing agents, cleaning fluids, ink solvents, incompletely burned coal or wood and many other sources. Plants also give off hydrocarbons such as terpenes from pine trees. Nitrogen oxides are emitted by all combustion sources.

The highest ozone levels generally occur during summer afternoons when the high temperatures and strong sunlight promote photochemical reactions. Stagnant weather may cause smog to remain in an area for several days. The winds may also transport ozone many miles outside of the urban environment. For example, it is estimated that one-third of the ozone in the State of Maine is transported into the State from sources located outside the State. In addition one-third of the ozone is naturally occurring background concentrations, part of which is also transported into the State. The remaining one-third is assumed to be due to local sources within the State. Because of long-range transport, local control of emissions by itself may not solve the ozone problem. An effective national program may be necessary to achieve national compliance.

Ground-level ozone, discussed above, should not be confused with the stratospheric ozone layer, located about seven miles high in the atmosphere, which shields the earth from cancer-causing ultraviolet rays. Concentrations of ozone in this layer may reach as high as 10 ppm. Concern over potential reduction of the necessary levels of ozone in the stratosphere by reactions with fluorocarbons from aerosol cans has resulted in the removal of most of these propellants from the market. However, ozone at ground level, where it is breathed, is a pollutant.

3.2 Health and Welfare Effects

Ozone at low concentrations causes eye irritations and at higher concentrations difficulty in breathing for people with respiratory problems, the elderly, and children. Many plants, such as white pine, soybeans and alfalfa, are extremely sensitive to ozone, and O_3 is known to weaken materials such as rubber and fabrics.

3.3 Standards

The existing National Ambient Air Quality Standards (NAAQS) for ozone is 0.12 ppm and will be attained when "the expected number of days per calender year with maximum hourly average concentrations above 0.12 ppm is equal to or less than one." This standard is new as of February 8, 1979 and replaces a more restrictive 0.08 ppm standard that was established April 10, 1971. The change was the result of a required assessment of existing NAAQS to include a review of new health effects data that have become available since 1970. As a result of this review and national public comments, the standard was changed to a level that is considered to be sufficient to protect the public health and welfare. The current State Standard is .08 ppm. It was established at the same time the original Federal Standard was established and has not been changed.

3.4 Monitoring

Ozone was monitored at six sites in Maine during 1983 using continuous monitoring equipment of two kinds, either chemiluminescence or ultra-violet absorption analyzers. Maines' ozone monitoring season is limited to April through October due to the weather conditions which are not conducive to ozone formation at other times of the year.

Table 3-1 is the 1983 Data Summary for Ozone. Table 3-2 presents the Ozone Historical Comparisons and Table 3-3 presents the Ozone Trends.

TABLE 3 - 1
1983 OZONE DATA SUMMARY
(Parts Per Million)

SITE	ADDRESS	NUMBER OF OBSERVATIONS	HIGHEST CONCENTRATION	SECOND HIGHEST CONCENTRATION	NUMBER OF VIOLATIONS STATE*	NUMBER OF VIOLATIONS FEDERAL**
ANDROSCOGGIN INTERSTATE AIR QUALITY CONTROL REGION (107)						
Gardiner	Gardiner High School	5023	.145	.140	101	2
DOWNEAST AIR QUALITY CONTROL REGION (109)						
Acadia National Park	McFarland Hill Ranger Station	7560	.138	.135	101	2
Deer Isle	Harrison Marshall Property	4874	.142	.140	116	0
METROPOLITAN PORTLAND AIR QUALITY CONTROL REGION (110)						
Cape Elizabeth	Shelter Site	5011	.172	.163	189	9
Pownal	Trailer Site	3789	.135	.117	51	0
Kennebunkport	Parson's Way	3873	.149	.148	155	7

* Total number of hours minus one greater than .080 ppm.
** Number of days in violation.

TABLE 3-2
OZONE HISTORICAL COMPARISONS
(1-Hour Concentrations)

CAPE ELIZABETH
Shelter Site

YEAR	SECOND HIGH	# OF STATE VIOLATIONS
1978	.160 PPM	122
1979	.155 PPM	119
1980	.178 PPM	144
1981	.122 PPM	101
1982	.140 PPM	120
1983	.163 PPM	189

POWNAL
Trailer Site

YEAR	SECOND HIGH	# OF STATE VIOLATIONS
1980	.123 PPM	47
1981	.116 PPM	25
1982	.105 PPM	34
1983	.117 PPM	51

GARDINER
Gardiner High School

YEAR	SECOND HIGH	# OF STATE VIOLATIONS
1980	.143 PPM	54
1981	.122 PPM	33
1982	.122 PPM	58
1983	.140 PPM	101

DEER ISLE
Harrison Marshall Property

YEAR	SECOND HIGH	# OF STATE VIOLATIONS
1982	.115 PPM	46
1983	.140 PPM	116

TABLE 3-3
OZONE TRENDS
(1-Hour Concentrations)

CAPE ELIZABETH
Shelter Site

YEAR	PERCENTILES 10%	50%	90%
1978	.015	.035	.065
1979	.018	.036	.070
1980	.019	.035	.065
1981	.015	.032	.056
1982	.018	.036	.058
1983	.018	.034	.061

POWNAL
Trailer Site

YEAR	PERCENTILES 10%	50%	90%
1980	.004	.025	.052
1981	.003	.023	.049
1982	.005	.026	.048
1983	.003	.026	.052

GARDINER
Gardiner High School

YEAR	PERCENTILES 10%	50%	90%
1980	.008	.031	.056
1981	.009	.029	.050
1982	.009	.030	.053
1983	.009	.031	.056

DEER ISLE
Harrison Marshall Property

YEAR	PERCENTILES 10%	50%	90%
1982	.010	.025	.055
1983	.022	.035	.060

4. NITROGEN DIOXIDE (NO_2)

4.1 Description and Sources

In its pure state, nitrogen dioxide is a reddish-orange-brown gas with a characteristic pungent odor. It is corrosive and a strong oxidizing agent. Nitrogen dioxide comprises about 10% of the oxides of nitrogen (NO_x) that are formed when nitrogen in the air combines with oxygen during high temperature combustion. Most of the rest of the NO_x emitted by combustion sources is nitric oxide (NO). However, during the day most of the NO is photochemically transformed into NO_2. Thus, essentially all the NO_x emitted can be assumed to eventually become NO_2.

4.2 Health and Welfare Effects

Exposure to NO_2 affects the delicate structure of lung tissue. High levels cause lung irritation and potential lung damage. Lower levels have been associated with increased respiratory disease. Oxides of nitrogen can cause serious injury to vegetation, including bleaching or death of plant tissue, loss of leaves, and reduced growth rate. NO_x also deteriorates fabrics and fades fabric dyes. Nitrate salts formed from nitrogen oxides have been associated with the corrosion of metals. Nitrogen oxides can also reduce visibility.

4.3 Standards

The current standard for NO_2 is an annual arithmetic mean (average) value not to exceed .05 ppm. NO_2 is the only gaseous pollutant for which only a long-term (annual average) standard has been established.

4.4 Monitoring

Nitrogen Dioxide was monitored at one site in Maine during 1983 using continuous monitoring equipment.

Table 4-1 is the 1983 Data Summary for NO_2. Table 4-2 presents the NO_2 Historical Comparison.

TABLE 4 - 1
1983 NITROGEN DIOXIDE DATA SUMMARY
(Parts Per Million)

SITE	ADDRESS	NUMBER OF OBSERVATIONS	ANNUAL AVERAGE
METROPOLITAN PORTLAND AIR QUALITY CONTROL REGION (110)			
Portland*	Shelter Site (P.E.O.P.L.)	2833	.025

* This site operated only during the ozone season in 1983.

TABLE 4 - 2
NITROGEN DIOXIDE HISTORICAL COMPARISONS
(Annual Concentrations in PPM)

SITE	ADDRESS	1980	1981	1982	1983
METROPOLITAN PORTLAND AIR QUALITY CONTROL REGION (110)					
Portland*	Shelter Site (P.E.O.P.L.)	.013	.029	.016	.025

* This site operated only during the ozone season in 1983.

5. SULFUR DIOXIDE (SO_2)

5.1 Description and Sources

Sulfur dioxide is a colorless irritating gas having the same pungent odor as a struck match. Most people can detect its taste at a level of about 0.3 to 1 part per million. SO_2 is highly soluble in water, forming sulfurous acid. On a worldwide basis, SO_2 is considered to be one of the major pollution problems. It is emitted mainly from stationary sources that utilize fossil fuels (coal, oil) such as power plants, ore smelters, and refineries.

5.2 Health and Welfare Effects

The health effects of sulfur dioxide appear to be always associated with high levels of particulates or other pollutants. The world's major recorded air pollution disasters have been associated with high levels of sulfur dioxide and particulates. The excess deaths attributed to these pollutants were due to respiratory failures and occurred predominantly, but not exclusively, in the elderly and infirm. Atmospheres containing high levels of sulfur dioxide are associated with elevated concentrations of other sulfur compounds such as sulfates and sulfuric acid mists, which are corrosive and potentially carcinogenic.

The corrosiveness of SO_2 and its derivatives also causes crop and material damage. Its transport and transformation into sulfurous and sulfuric acids contribute to acid precipitation, causing soils and lakes to become seriously acidified.

5.3 Standards

There are two existing Primary National Ambient Air Quality Standards for sulfur dioxide. The first is a long-term one year arithmetic average of 0.03 parts per million (ppm). The second is a short-term 24-hour average standard where concentrations are not to exceed 0.14 ppm more than once per year. The current Secondary NAAQS for SO_2 is a 3-hour average concentration of 0.5 ppm not to be exceeded more than once per year.

In addition there are three state standards for sulfur dioxide. The first is a long-term one-year arithmetic average of .022 parts per million. The second is a short-term 24-hour average standard of .088 ppm not to be exceeded. The third is a short-term 3-hour average concentration of .439 ppm not to be exceeded.

5.4 Monitoring

Sulfur dioxide was monitored at thirty-eight sites in Maine during 1983 using continuous monitoring equipment utilizing either the pulsed fluorescent or coulometric methods.

Table 5-1 is the 1983 Data Summary for SO_2. Tables 5-2 and 5-3 present the SO_2 Historical Comparison Data.

TABLE 5 - 1
1983 SULFUR DIOXIDE DATA SUMMARY
(Parts Per Million)

SITE	ADDRESS	NUMBER OF OBSERVATIONS	HIGHEST 3-HOUR AVERAGE	SECOND HIGHEST 3-HOUR AVERAGE	HIGHEST 24-HOUR AVERAGE	SECOND HIGHEST 24-HOUR AVERAGE	ANNUAL ARITHMETIC MEAN
ANDROSCOGGIN INTERSTATE AIR QUALITY CONTROL REGION (107)							
Auburn	Woodbury Hill	7739	.046	.042	.018	.015	.002
Auburn	Martindale Country Club	7902	.055	.052	.019	.017	.003
Jay	Jay Hill	5271	.047	.042	.016	.016	.004*
Jay	Bracketts	5258	.081	.058	.020	.019	.005*
Jay	Water Treatment Plant	5087	.056	.051	.014	.014	.003*
Lewiston	Country Kitchen Parking Lot	8089	.115	.103	.044	.039	.008
Mexico	Carver's Residence	8126	.162	.128	.045	.039	.005
Mexico	Hunt's	5616	.173	.137	.061	.057	.008*
Canton	Kennett's Property	5252	.094	.084	.022	.019	.004*
Rockland	Park Street Warehouse	5431	.065	.060	.039	.032	.004*
Rockland	Benner Hill	4439	.058	.022	.016	.010	.002*
Rumford	Taylor Mountain I	8300	.267	.249	.077	.077	.014
Rumford	Taylor Mountain II	7571	.226	.214	.072	.067	.008
Rumford	Village Green Site	5218	.152	.149	.054	.035	.004*
Thomaston	Dexter Avenue	5535	.026	.026	.016	.012	.002*
Thomaston	Swamp Site	6001	.030	.025	.011	.009	.001*
Thomaston	Marsh Road	6006	.023	.016	.011	.007	.002*
Thomaston	Route #1	5219	.021	.018	.011	.009	.002*
AROOSTOOK AIR QUALITY CONTROL REGION (108)							
Madawaska	Madawaska High School	8277	.158	.136	.049	.043	.005
Madawaska	Albert Street	8299	.395	.217	.130	.100	.013
Madawaska	Sewage Treatment Plant	8112	.283	.182	.060	.056	.007
DOWNEAST AIR QUALITY CONTROL REGION (109)							
East Millinocket	Katahdin School	8223	.137	.072	.054	.026	.003
Lincoln	Lincoln Post Office Building	2027	.086	.079	.055	.045	.007*
Lincoln	Thomas Motel Trailer Park	8219	.133	.129	.052	.041	.004
Lincoln	Fish Hill Base	8186	.067	.059	.023	.022	.003
Lincoln	Fish Hill Peak	5730	.185	.123	.031	.031	.004*
Millinocket	Wastewater Treatment Plant	8242	.213	.150	.077	.063	.007
Millinocket	York Street	8042	.197	.127	.065	.048	.005
Millinocket	East Avenue	486	.051	.037	.021	.013	.004*
Millinocket	Municipal Wastewater Treatment P.	2103	.052	.050	.031	.016	.003*
Woodland	Secondary Treatment Pipeline	7984	.175	.162	.058	.051	.006
METROPOLITAN PORTLAND AIR QUALITY CONTROL REGION (110)							
Biddeford	Biddeford Treatment Plant	2022	.185	.185	.066	.062	.018*
Kittery	Greenfield Drive	7351	.100	.081	.043	.033	.004
Kittery	Masonic Temple	6795	.134	.100	.043	.041	.008
Portland	Maine National Bank	6885	.082	.075	.057	.047	.012
Portland	Shelter Site	1221	.077	.075	.056	.047	.017*
Westbrook	Warehouse #5	1729	.122	.115	.045	.029	.011*
Westbrook	Duck Pond Road	1793	.038	.031	.012	.011	.003*

* Insufficient data collected for valid annual arithmetic mean.

TABLE 5 - 2
HISTORICAL COMPARISONS - MAXIMUM 24-HOUR CONCENTRATIONS OF SULFUR DIOXIDE

SITE	ADDRESS	MAXIMUM 24-HOUR CONCENTRATIONS 1978	1979	1980	1981	1982	1983
ANDROSCOGGIN INTERSTATE AIR QUALITY CONTROL REGION (107)							
Auburn	Woodbury Hill	--	--	--	--	.014	.018
Jay	Jay Hill	--	--	--	.021	.026	.016
Jay	Bracketts	--	--	--	.024	.025	.020
Jay	Water Treatment Plant	--	--	--	.015	.023	.014
Lewiston	Country Kitchen Parking Lot	--	--	--	.035	.056	.044
Mexico	Carver's Residence	--	--	--	--	.042	.045
Canton	Kennett's Property	--	--	--	.031	.038	.022
Rockland	Park Street Warehouse	--	--	--	--	.045	.039
Rockland	Benner Hill	--	--	.021	.013	.016	.016
Rumford	Taylor Mountain I	--	--	--	--	.075	.077
Thomaston	Dexter Avenue	--	--	.017	.026	.030	.016
Thomaston	Swamp Site	--	--	.012	.022	.024	.011
Thomaston	Marsh Road	--	--	.017	.010	.016	.011
Thomaston	Route #1	--	--	.011	.011	.015	.011
AROOSTOOK AIR QUALITY CONTROL REGION (108)							
Madawaska	Madawaska High School	.042	.124	.062	.125	.139	.049
Madawaska	Albert Street	--	.174	.132	.135	.152	.130
Madawaska	Sewage Treatment Plant	--	.108	.073	.085	.083	.060
DOWNEAST AIR QUALITY CONTROL REGION (109)							
East Millinocket	Katahdin School	--	--	.118	.077	.072	.054
Lincoln	Lincoln Post Office Building	--	--	--	.226	.073	.055
Lincoln	Thomas Motel Trailer Park	--	--	--	--	.062	.052
Millinocket	Wastewater Treatment Plant	.211	.207	.264	.084	.078	.077
Millinocket	York Street	.341	.303	.149	.092	.063	.065
Millinocket	East Avenue	--	.156	.114	.044	.030	.021
Millinocket	Municipal Wastewater Treatment P.	--	--	--	--	.031	.031
Woodland	Secondary Treatment Pipeline	--	--	.037	.103	.022	.058
METROPOLITAN PORTLAND AIR QUALITY CONTROL REGION (110)							
Biddeford	Biddeford Treatment Plant	--	--	--	--	.079	.066
Kittery	Greenfield Drive	--	--	--	--	.006	.043
Portland	Maine National Bank	.065	.081	.068	.058	.056	.057
Westbrook	Warehouse #5	--	--	--	--	.032	.045
Westbrook	Duck Pond Road	--	--	--	--	.019	.012

TABLE 5 - 3
SULFUR DIOXIDE HISTORICAL COMPARISONS
(Sites With Violations)

SITES	ADDRESS	TOTAL NUMBER OF VIOLATIONS* 1978	1979	1980	1981	1982	1983
AROOSTOOK AIR QUALITY CONTROL REGION (108)							
Madawaska	Madawaska High School	0	1	0	1	1	0
Madawaska	Albert Street	--	5	10	7	7	2
Madawaska	Sewage Treatment Plant	--	2	0	0	0	0
DOWNEAST AIR QUALITY CONTROL REGION (109)							
Lincoln	Lincoln Post Office	--	--	--	10	0	0
Millinocket	Wastewater Treatment Plant	48	32	31	0	0	0
Millinocket	York Street	37	22	14	1	0	0
Millinocket	East Avenue	--	2	1	0	0	0
Woodland	Secondary Treatment Pipeline	--	--	0	1	0	0

* Includes 3-Hour and 24-Hour Violations.

6. PARTICULATES (TSP)

Particulates is the term given to the tiny particles of solid or semi-solid material found in the atmosphere. It is this "dirt" in the air that is visible as a "Brown Cloud", haze or smog. The sources of particulates are many: wind-blown dust and sand from roadways, fields, and construction; coal dust, fly ash, and carbon black from various combustion sources; and automobile exhaust, to name a few. Particulates that range in size from less than 0.1 micrometer up to approximately 45 micrometers are called "total suspended particulates". Particles larger than that range tend to settle out of the air and not remain suspended, except in high winds.

6.2 Health and Welfare Effects

The human nose filters out 99 percent of the large and medium-sized particles. The rest enter the windpipe and lungs, where some, known as inhalable particulates, cling to protective mucous and are removed. Some of the smallest, called respirable particulates, are deposited in the lungs' tiny air sacs (alveoli).

In the lungs particulates slow down the exchange of oxygen with carbon dioxide in the blood, causing shortness of breath. The heart may be strained because it must work harder to compensate for oxygen loss. Usually the people most sensitive to these conditions have respiratory diseases like emphysema, bronchitis, asthma, or heart problems. The elderly and children are also sensitive.

Particles themselves may be poisonous if inhaled or absorbed, damaging remote organs like the kidneys or liver. Swallowed mucous that is laden with poisionous particulate matter may damage the stomach.

In addition, particulates may be carriers of poisonous liquid or gaseous substances. Sulfur dioxide, a major air pollutant in its own right, is frequently absorbed by particulates and can react with them to form sulfates. Sulfates react with moisture in the air or in the respiratory tract to form corrosive liquid (sulfuric acid) that irritates delicate membranes and slows down the cleansing action of mucous. This effect can reduce the body's ability to remove harmful bacteria, increasing the possibility of infection.

Adverse health effects from particulate matter aren't always seen immediately. Particulates can accumulate in the lungs after repeated, long-term exposure, causing respiratory distress and other health problems that may be manifested later.

Particles in the air block out and scatter sunlight, reducing visibility. Particulates soil and corrode metals, masonry, and textiles. Irritating odors are often associated with particulates, also.

6.3 Standards

Primary:

The current primary particulate standards are for total suspended

particulates (TSP), independent of particle size or chemical composition. The long-term standard is an annual geometric mean not to exceed 75 micrograms of particulates per cubic meter of air (ug/m^3). The short-term standard is a 24-hour average of 260 ug/m^3 not to be exceeded more than once per year.

EPA has proposed revised particulate standards to account for the deeper inhalability of smaller particles. The new standards, rather than applying to TSP, would apply to inhalable or fine particulates. A particle size of 10 micrometers is being considered as the upper size limit with a 24-hour concentration in the range of 150-250 ug/m^3 and an annual standard in the range of 50 to 65 ug/m^3.

Secondary:

The current secondary TSP standard is a 24-hour average of 150 ug/m^3 not to be exceeded more than once per year, designed to protect from soiling, corrosion, etc.

EPA is also considering replacing the current 24-hour secondary TSP standard with an annual TSP standard to be selected from a range of 70 to 90 ug/m^3, expected annual arithmetric mean.

State Standards:

The current State Standards include an annual geometric mean of 60 micrograms per cubic meter and a 24-hour standard of 150 micrograms per cubic meter not to be exceeded.

6.4 Monitoring

Particulates were monitored at 73 sites in Maine during 1983 using High-Volume Particulate Air Samplers (Hi-Vols).

Hi-Vols operate on the same principle as a vacuum cleaner in that the air is drawn through a filter to "catch the dust". The difference is that a Hi-Vol draws a calibrated volume of air through a pre-weighed filter pad (rather than a bag) for a twenty-four hour period. The change in weight of the filter pad is recorded as total suspended particulate or TSP in micrograms of particulates per cubic meter of air.

Table 6-1 is a summary of the TSP data collected in Maine during 1983. Table 6-2 is a historical comparison of the TSP Annual Geometric Means at sites which have been in existence over the last two years. Table 6-3 summarizes the number of TSP violations which have occurred over the last six years and the sites at which they occurred.

Fine particulate sampling increased dramatically during 1983. The increased sampling has been conducted to obtain data to evaluate the proposed fine particulate standards. The sampling has been conducted with dichotomous samplers and size-selective hi-vols. The dichotomous samplers collect particles smaller than either 15 or 10 microns in two different size classes. The two classes are summed to give a total fine particulate. The size-selective hi-vols collect particles 10 microns and smaller.

The data collected and the sites which were in operation during 1983 have been summarized in Table 6-4.

TABLE 6 - 1
1983 TOTAL SUSPENDED PARTICULATES DATA SUMMARY
(Micrograms Per Cubic Meter)

SITE	ADDRESS	NUMBER OF OBSERVATIONS	HIGHEST 24-HOUR	SECOND HIGHEST	THIRD HIGHEST	ANNUAL GEOMETRIC MEAN
ANDROSCOGGIN INTERSTATE AIR QUALITY CONTROL REGION (107)						
Auburn	Lepage Bakery	113	168	150	147	39.3
Augusta	Cony High School	136	233	167	147	48.9
Augusta	Hartford Fire House	118	290	218	190	48.1*
Jay	Weather Level I	349	164	153	121	33.0*
Jay	Crash Road	348	118	117	112	18.0*
Jay	Jay Hill	343	124	123	98	25.2*
Jay	Water Treatment Plant Site #2	335	93	90	84	19.0*
Farmingdale	4800 Northern Avenue	141	70	69	62	20.6
Wayne	Norton's Residence	1	36	--	--	36.0*
Lewiston	Lewiston Post Office	114	162	160	127	41.5
Madison	Madison Municipal Building	14	242	167	91	70.5*
Madison	Coro Property	14	164	113	96	56.0*
Mexico	Mexico Treatment Plant	218	146	121	105	39.1
Mexico	Labonville's	214	146	143	142	50.6
Mexico	Carver's Residence	219	111	110	107	35.6
South Paris	Bessey Motors	29	141	139	112	64.8*
South Paris	Reilly Property	33	174	158	155	77.6*
Rumford	Taylor Mountain I	207	133	98	91	34.8
Rumford	Taylor Mountain II	192	115	93	79	26.0
Rumford	Village Green Site	119	117	86	68	30.1*
Skowhegan	Hinckley	142	81	65	60	17.3
Skowhegan	Eaton Ridge	143	72	62	54	15.4
Thomaston	Dexter Avenue	206	129	104	96	22.0
Thomaston	Sanders Property	199	76	74	68	21.9
Thomaston	Pease Property	198	124	109	107	28.0
Thomaston	Marsh Road	199	136	76	69	22.7
Brooks	Ryan Property	5	93	70	48	52.7*
Waterville	Al Corey's Music Store	97	193	109	109	41.9*
AROOSTOOK AIR QUALITY CONTROL REGION (108)						
Fort Kent	UMFK	40	253	203	181	42.8*
Madawaska	Madawaska High School	144	311	310	248	44.1
Madawaska	Albert Street	75	89	78	66	34.3*
Presque Isle	Presque Isle High School	10	192	143	108	48.8*
Presque Isle	Skyway School	10	73	43	39	28.6*
Presque Isle	Northeastland Hotel	167	448	294	284	66.8
Presque Isle	Steego Auto Parts	10	152	129	105	52.2*
Presque Isle	Creasey Ridge Road	245	58	56	49	12.8
DOWNEAST AIR QUALITY CONTROL REGION (109)						
Acadia National Park	McFarland Hill Ranger Station	41	45	42	35	11.6*
Bangor	Regional Office	206	160	146	141	41.7
Bangor	Kenduskeag Pump Station	206	193	162	139	49.8
Bangor	Bangor Daily News	210	298	269	152	41.7

TABLE 6 - 1

SITE	ADDRESS	NUMBER OF OBSERVATIONS	HIGHEST 24-HOUR	SECOND HIGHEST	THIRD HIGHEST	ANNUAL GEOMETRIC MEAN
Bangor	BIA - Building #487	203	93	87	79	24.6
Brewer	Brewer Fire Station	62	134	131	127	48.7*
Brewer	Brewer Junior High School	116	124	113	106	37.0
Brewer	Wastewater Treatment Plant	40	88	85	67	33.8*
East Millniocket	Katahdin School	111	269	120	118	27.4
Lincoln	Vocational Education Building	354	154	153	138	36.2
Lincoln	Lincoln Post Office Building	357	218	200	192	39.8
Lincoln	Thomas Motel Trailer Park	349	189	189	163	40.9
Millinocket	York Street	345	251	162	161	43.8
Millinocket	East Avenue	44	139	125	115	49.4*
Old Town	Marsh Island Apartments	118	145	136	128	35.8
Old Town	Penobscot Shoe Company	117	149	93	90	28.0
Newburgh	Newburgh School	338	125	63	61	15.8
Milford	Shumway Field	219	84	79	77	25.7*
Woodland	"D" Street	348	143	131	112	23.5
Woodland	Secondary Treatment Pipeline	347	239	171	165	32.3
Woodland	Woodland High School	349	338	292	230	35.0
Woodland	Chip-N-Saw Waferboard Mill	245	143	136	122	30.0
METROPOLITAN PORTLAND AIR QUALITY CONTROL REGION (110)						
Biddeford	Biddeford Treatment Plant	40	82	70	67	37.8*
Brunswick	Coastal Savings Bank	54	140	123	121	55.3*
Brunswick	Naval Air Station	59	113	82	79	35.9*
Kittery	Greenfield Drive	100	106	83	83	27.7
Kittery	Wentworth Dennet School	74	83	70	68	34.5*
Portland	Shelter Site	88	113	111	98	45.6
Portland	Mobil Station	45	120	111	96	42.8
South Portland	SMVTI	116	122	109	106	33.5*
Westbrook	N.E.T.&T. Company	353	140	122	108	36.5
Westbrook	Westbrook Police Department	39	126	114	113	60.5*
Westbrook	Research Building	337	166	157	141	52.2
Westbrook	Westbrook Hospital	116	101	97	86	33.1*
Westbrook	Park Road	33	80	59	57	39.3*
Westbrook	Warehouse #5	349	148	144	140	51.3

* Insufficient data collected for valid annual geometric mean.

TABLE 6 - 2
HISTORICAL COMPARISON OF TOTAL SUSPENDED PARTICULATES

SITE	ADDRESS	ANNUAL GEOMETRIC MEANS (ug/m^3) 1978	1979	1980	1981	1982	1983
ANDROSCOGGIN INTERSTATE AIR QUALITY CONTROL REGION (107)							
Auburn	Lepage Bakery	--	--	73.0	53.5	47.4	39.3
Augusta	Cony High School	49.8	53.5	62.1	59.5	48.5	48.9
Augusta	Hartford Fire House	--	--	--	--	46.9	48.1
Jay	Weather Level I	--	--	--	33.3	40.0	33.0
Jay	Crash Road	--	24.3	23.8	23.2	22.1	18.0
Jay	Jay Hill	--	27.8	28.0	27.5	28.5	25.2
Jay	Water Treatment Plant Site #2	--	--	--	--	21.5	19.0
Farmingdale	4800 Northern Avenue	--	--	--	--	23.5	20.6
Lewiston	Lewiston Post Office	51.7	48.0	56.7	53.1	50.8	41.5
Madison	Madison Municipal Building	--	--	--	39.7	42.6	70.5
Madison	Coro Property	--	--	--	32.1	41.4	56.0
Mexico	Mexico Treatment Plant	41.0	43.3	48.7	42.0	42.3	39.1
Mexico	Labonville's	--	--	--	48.3	53.5	50.6
Mexico	Carver's Residence	--	--	--	--	40.3	35.6
South Paris	Bessey Motors	69.6	56.4	57.4	52.6	66.1	64.8
South Paris	Reilly Property	73.3	59.6	53.6	58.7	69.5	77.6
Rumford	Taylor Mountain I	--	--	--	--	37.9	34.8
Skowhegan	Hinckley	19.8	19.7	16.5	16.1	18.5	17.3
Skowhegan	Eaton Ridge	19.6	24.3	16.5	16.5	17.4	15.4
Thomaston	Dexter Avenue	40.5	33.4	33.5	25.7	25.5	22.0
Thomaston	Sanders Property	--	26.9	29.0	24.5	23.7	21.9
Thomaston	Pease Property	--	40.4	50.0	37.8	34.0	23.0
Thomaston	Marsh Road	--	--	26.4	30.8	28.3	22.7
Brooks	Ryan Property	--	--	--	31.2	23.8	52.7
Waterville	Al Corey's Music Store	--	--	--	49.6	40.4	12.8
AROOSTOOK AIR QUALITY CONTROL REGION (108)							
Fort Kent	UMFK	--	--	--	--	33.7	42.8
Madawaska	Madawaska High School	37.3	39.1	47.1	43.7	47.1	44.1
Madawaska	Albert Street	--	25.3	41.0	37.3	35.2	34.3
Presque Isle	Presque Isle High School	38.7	39.9	40.8	44.5	35.1	48.8
Presque Isle	Skyway School	--	22.7	26.7	25.8	21.6	28.8
Presque Isle	Northeastland Hotel	--	--	49.1	67.0	62.0	66.8
Presque Isle	Steego Auto Parts	--	--	--	39.1	36.9	52.2
Presque Isle	Creasey Ridge Road	--	--	--	15.2	13.5	12.8
DOWNEAST AIR QUALITY CONTROL REGION (109)							
Bangor	Regional Office	54.1	51.9	45.3	45.3	42.7	41.7
Bangor	Kenduskeag Pump Station	75.5	68.4	58.3	53.8	52.1	49.8
Bangor	Bangor Daily News	57.6	52.6	48.1	47.0	43.4	41.7
Bangor	BIA - Building #487	32.3	31.4	29.3	28.5	24.7	24.8
Brewer	Brewer Fire Station	53.4	--	60.3	55.0	53.1	48.7
Brewer	Brewer Junior High School	--	--	41.4	43.6	36.4	37.0
East Millinocket	Katahdin School	--	--	31.3	26.3	30.9	27.4
Lincoln	Vocational Education Building	43.6	48.6	46.9	44.9	41.5	36.2

TABLE 6 - 2

SITE	ADDRESS	ANNUAL GEOMETRIC MEANS (ug/m^3) 1978	1979	1980	1981	1982	1983
Lincoln	Lincoln Post Office Building	52.4	53.6	57.1	49.5	46.6	39.8
Lincoln	Thomas Motel Trailer Park	--	--	--	--	44.4	40.9
Millinocket	York Street	--	50.5	48.9	42.7	43.3	43.8
Millinocket	East Avenue	--	36.1	38.6	33.4	34.1	49.4
Old Town	Marsh Island Apartments	40.2	38.3	44.5	42.6	38.6	35.8
Old Town	Penobscot Shoe Company	--	29.9	40.0	37.1	32.1	28.0
Newburgh	Newburgh School	--	--	23.6	19.2	15.9	15.8
Milford	Shumway Field	--	--	32.9	29.1	31.6	25.7
Woodland	"D" Street	--	29.9	31.7	26.6	25.3	23.5
Woodland	Secondary Treatment Pipeline	--	39.7	35.0	33.0	31.6	32.3
Woodland	Woodland High School	--	--	32.3	44.9	36.6	35.0
Woodland	Chip-N-Saw Waferboard Mill	--	--	--	38.2	32.8	30.0
METROPOLITAN PORTLAND AIR QUALITY CONTROL REGION (110)							
Biddeford	Biddeford Treatment Plant	--	--	--	47.2	43.0	37.8
Brunswick	Coastal Savings Bank	--	--	--	--	42.0	55.3
Brunswick	Naval Air Station	--	--	--	--	30.7	35.9
Kittery	Greenfield Drive	--	--	--	--	32.0	27.7
Portland	Shelter Site	--	--	53.5	50.4	48.2	45.6
Portland	Mobil Station	--	--	--	--	51.2	42.8
South Portland	SMVTI	30.5	30.9	40.5	37.2	32.5	33.5
Westbrook	N.E.T.&T. Company	--	43.7	42.4	38.8	44.0	36.5
Westbrook	Westbrook Police Department	--	--	59.3	60.3	55.6	60.5
Westbrook	Research Building	--	--	55.7	52.0	55.3	52.2
Westbrook	Westbrook Hospital	--	--	--	31.2	36.0	33.1
Westbrook	Park Road	--	--	--	33.3	37.5	39.3
Westbrook	Warehouse #5	--	--	--	68.4	59.9	51.3

TABLE 6 - 3
TOTAL SUSPENDED PARTICULATES HISTORICAL COMPARISON
(Sites With Violations)

SITE	ADDRESS	TOTAL NUMBER OF SHORT TERM VIOLATIONS 1978	1979	1980	1981	1982	1983
ANDROSCOGGIN INTERSTATE AIR QUALITY CONTROL REGION (107)							
Auburn	Lepage Bakery	--	--	--	0	4	1
Augusta	Cony High School	2	4	5	4	7	2
Augusta	Hartford Fire House	--	--	--	--	6	6
Jay	Weather Level I	--	--	--	--	0	1
Jay	Crash Road	--	0	0	1	2	0
Jay	Jay Hill	--	0	1	1	2	0
Lewiston	Lewiston Post Office	0	0	0	2	3	2
Madison	Madison Municipal Building	--	--	--	0	1	2
Madison	Coro Property	--	--	--	--	0	1
Mexico	Mexico Treatment Plant	0	1	1	0	0	0
Mexico	Labonville's	--	--	--	1	0	0
South Paris	Bessey Motors	2	3	4	0	1	0
South Paris	Reilly Property	10	8	3	1	0	4
Skowhegan	Eaton Ridge	0	1	0	0	0	0
Thomaston	Dexter Avenue	--	--	--	1	1	0
Thomaston	Pease Property	--	0	1	0	0	0
Thomaston	Marsh Road	--	--	--	1	3	0
Waterville	Al Corey's Music Store	--	--	--	2	1	1
AROOSTOOK AIR QUALITY CONTROL REGION (108)							
Fort Kent	UMFK	--	--	--	--	0	3
Madawaska	Madawaska High School	0	1	2	9	13	8
Presque Isle	Presque Isle High School	0	1	0	3	0	1
Presque Isle	Northeastland Hotel	--	--	0	10	12	11
Presque Isle	Steego Auto Parts	--	--	--	0	1	1
DOWNEAST AIR QUALITY CONTROL REGION (109)							
Bangor	Regional Office	0	1	0	2	2	1
Bangor	Kenduskeag Pump Station	10	7	4	3	6	2
Bangor	Bangor Daily News	0	2	1	3	4	4
Brewer	Brewer Fire Station	0	--	3	2	4	0
East Millinocket	Katahdin School	--	--	2	0	0	1
Lincoln	Vocational Education Building	0	2	5	4	4	2
Lincoln	Lincoln Post Office Building	1	2	5	7	6	7
Lincoln	Thomas Motel Trailer Park	--	--	--	--	10	4
Millinocket	York Street	--	0	6	2	2	3
Millinocket	East Avenue	--	0	2	0	1	0
Old Town	Marsh Island Apartments	0	1	0	1	1	0
Old Town	Penobscot Shoe Company	--	0	3	1	2	0
Woodland	Secondary Treatment Pipeline	--	2	4	3	0	5
Woodland	Woodland High School	--	--	0	3	0	8

TABLE 6 - 3
TOTAL SUSPENDED PARTICULATES HISTORICAL COMPARISON
(Sites With Violations)

SITE	ADDRESS	TOTAL NUMBER OF SHORT TERM VIOLATIONS 1978	1979	1980	1981	1982	1983
METROPOLITAN PORTLAND AIR QUALITY CONTROL REGION (110)							
Biddeford	Biddeford Treatment Plant	--	--	--	0	1	0
Westbrook	Research Building	--	--	0	0	5	2
Westbrook	Warehouse #5	--	--	--	0	4	0

TABLE 6 - 4
1983 FINE PARTICULATE DATA SUMMARY

SITE	ADDRESS	NUMBER OF OBSERVATIONS	HIGHEST 24-HOUR	SECOND HIGHEST	THIRD HIGHEST	ANNUAL ARITHMETIC MEAN	ANNUAL GEOMETRIC MEAN
ANDROSCOGGIN INTERSTATE AIR QUALITY CONTROL REGION (107)							
Augusta	Cony High School	66	106	76	66	30.3	26.0
Jay	Weather Level I	72	72	64	61	27.8	23.6
Farmingdale	4800 Northern Avenue	67	51	51	48	16.7	13.6
AROOSTOOK AIR QUALITY CONTROL REGION (108)							
Madawaska	Madawaska High School	31	49	45	44	27.0	24.2
Presque Isle	Northeastland Hotel	49	117	102	91	37.8	30.6
DOWNEAST AIR QUALITY CONTROL REGION (109)							
Bangor	Kenduskeag Pump Station	22	51	50	45	25.5	19.3
Newburgh	Newburgh School	20	32	30	21	12.6	10.3

7. LEAD (Pb)

7.1 Description and Sources

Lead in the ambient air exists primarily as particulate matter in the inhalable size range. The predominant source of atmospheric lead is from motor vehicles that burn "leaded" gasoline. The lead in gasoline is in the form of tetraethyl lead, an "anti-knock" compound. Other major sources of atmospheric lead are the extraction and processing of metallic ores.

7.2 Health and Welfare Effects

When atmospheric lead is breathed in, it is absorbed into the bloodstream and distributed throughout the body along with lead from contaminated food and drinking water. Lead accumulation in the body can impair the production of hemoglobin. Clinical lead poisoning occurs when the body's accumulation of lead becomes too high. Symptoms of lead poisoning range from loss of appetite, fatigue, cramps and constipation, and pains in the ankles and wrists to loss of power in the arms and legs, anemia, kidney disease, mental retardation, blindness and death. Lead concentrations in the ambient air are not sufficient to produce lead poisoning but they do increase the risk of harm when other sources of lead are present. And, indirectly, lead fallout from automotive exhaust onto soil and street surfaces can be ingested in considerable amounts by infants and young children.

7.3 Standards

The current National Ambient Air Quality Standard for lead is a 3-month (calendar quarter) average concentration not to exceed 1.5 micrograms of lead per cubic meter of air.

The current State Standard for lead is a 24-hour average concentration of 1.5 micrograms of lead per cubic meter of air not to be exceeded more than once per year.

7.4 Monitoring

Lead was monitored at nine sites in Maine during 1983 by taking samples of the Hi-Vol filters from those sites and analyzing the samples for lead content using an atomic absorption analyzer.

Tables 7-1 and 7-2 are the 1983 Data Summaries for Lead. Table 7-3 presents the Lead Historical Comparison Data.

TABLE 7 - 1
1983 LEAD DATA SUMMARY
(Micrograms Per Cubic Meter)

SITE	ADDRESS	NUMBER OF OBSERVATIONS	HIGHEST 24-HOUR	SECOND HIGHEST	THIRD HIGHEST	ANNUAL ARITHMETIC MEAN
ANDROSCOGGIN INTERSTATE AIR QUALITY CONTROL REGION (107)						
Augusta	Cony High School	52	.70	.48	.44	.20
Lewiston	Lewiston Post Office	54	.54	.40	.33	.16
AROOSTOOK AIR QUALITY CONTROL REGION (108)						
Madawaska	Madawaska High School	22	.14	.10	.08	.05
Presque Isle	Northeastland Hotel	56	.93	.50	.46	.19
Presque Isle	Creasey Ridge Road	42	.08	.07	.05	.03
DOWNEAST AIR QUALITY CONTROL REGION (109)						
Bangor	Kenduskeag Pump Station	58	.59	.47	.38	.18
METROPOLITAN PORTLAND AIR QUALITY CONTROL REGION (110)						
Kittery	Greenfield Drive	56	.39	.35	.23	.11
Portland	Shelter Site	63	.56	.55	.42	.20
Portland	Tukey's Bridge	83	1.44	1.20	.97	.49

TABLE 7 - 2
1983 LEAD DATA SUMMARY BY QUARTERS
(Micrograms Per Cubic Meter)

SITE	ADDRESS	1983 QUARTERLY AVERAGES 1ST	2ND	3RD	4TH
ANDROSCOGGIN INTERSTATE AIR QUALITY CONTROL REGION (107)					
Augusta	Cony High School	.21	.17	.21	.21
Lewiston	Lewiston Post Office	.18	.13	.16	.18
AROOSTOOK AIR QUALITY CONTROL REGION (108)					
Madawaska	Madawaska High School	---	.05	.05	.06
Presque Isle	Northeastland Hotel	.31	.12	.15	.19
Presque Isle	Creasey Ridge Road	.03	.03	.04	.03
DOWNEAST AIR QUALITY CONTROL REGION (109)					
Bangor	Kenduskeag Pump Station	.24	.15	.14	.20
METROPOLITAN PORTLAND AIR QUALITY CONTROL REGION (110)					
Kittery	Greenfield Drive	.10	.16	---	---
Portland	Shelter Site	.20	.16	.23	---
Portland	Tukey's Bridge	.41	.45	.61	---

TABLE 7 - 3
LEAD HISTORICAL COMPARISONS
(Micrograms Per Cubic Meter)

SITE	ADDRESS	MAXIMUM 24-HOUR CONCENTRATION/AAM 1978	1979	1980	1981	1982	1983
ANDROSCOGGIN INTERSTATE AIR QUALITY CONTROL REGION (107)							
Augusta	Cony High School	2.06/1.03	1.46/0.48	0.99/0.34	0.73/0.24	0.66/0.24	0.70/0.20
Lewiston	Lewiston Post Office	1.75/0.85	1.23/0.40	0.90/0.28	1.11/0.29	0.97/0.24	0.54/0.16
AROOSTOOK AIR QUALITY CONTROL REGION (108)							
Presque Isle	Northeastland Hotel	---	---	0.52/0.21	0.93/0.22	0.89/0.24	0.93/0.19
DOWNEAST AIR QUALITY CONTROL REGION (109)							
Bangor	Kenduskeag Pump Station	2.08/1.19	1.16/0.44	0.85/0.30	0.62/0.22	0.70/0.24	0.59/0.18
METROPOLITAN PORTLAND AIR QUALITY CONTROL REGION (110)							
Kittery	Greenfield Drive	---	---	---	---	0.58/0.18	0.39/0.11
Portland	Shelter Site	---	---	---	---	0.91/0.29	0.56/0.20
Portland	Tukey's Bridge	---	---	---	1.45/0.59	1.28/0.52	1.44/0.49

8. SULFATES (SO_4)

8.1 Description and Sources

Sulfates are compounds of varying harmfulness found everywhere in the atmosphere. They are produced by nature as well as man. Man-made sulfates have their origin in sulfur dioxide. Fine particulate compounds, including sulfates are formed from chemical reactions between sulfur dioxide emitted into the air and other substances present there. These fine particulate compounds have a long atmospheric residence time, can be transported in the air for long distances, and are capable of penetrating deeply into the human respiratory tract.

8.2 Health and Welfare Effects

Epidemiological studies of populations exposed to particulate sulfates have shown that atmospheric sulfates, more than sulfur dioxide gas or total suspended particulates, are related to aggravation of asthma, aggravation of heart and lung disease in the elderly, and impairment of lung function in school children. This evidence was obtained from EPA's Community Health and Environmental Surveillance System (CHESS). From these studies, estimates of the sulfate threshold for adverse health effects have been derived, as shown in Table 8-1. However, these epidemiological studies have not been substantiated by laboratory studies.

8.3 Standards

There are currently no standards for levels of sulfates in ambient air. EPA is presently working on a standard and will be making a proposal in the near future.

8.4 Monitoring

Sulfate levels were measured at thirteen sites in Maine during 1983 by taking samples of the Hi-Vol filters from those sites and analyzing the samples for sulfates. Some of the sites are analyzed for sulfates on a routine basis while others may only be anlyzed if there has been a violation of an ambient air standard. Because there are no standards and the monitoring methodology is still questionable the data has not been included in this report. As soon as the accuracy of the monitoring methodology is confirmed and a standard is proposed the data will be summarized in the annual reports.

TABLE 8-1

SULFATE THRESHOLDS FOR ADVERSE HEALTH EFFECTS

ADVERSE HEALTH EFFECT	THRESHOLD CONCENTRATION FOR SUSPENDED SULFATES
Aggravation of Asthma	6 to 10 Micrograms Per Cubic Meter for 24 Hours.
Aggravation of Heart and Lung Disease in the Elderly	9 Micrograms Per Cubic Meter for 24 Hours
Subtle Decreases in Childhood Lung Function	9 to 13 Micrograms Per Cubic Meter for 1 Year.
Increase in Acute Respiratory Disease in Children	13 Micrograms Per Cubic Meter for 1 Year.

9. ATMOSPHERIC DEPOSITION

9.1 Description and Sources

As a result of the combustion of tremendous quantities of fossil fuels such as coal and oil, the United States annually discharges approximately 50 million metric tons of sulfur and nitrogen oxides into the atmosphere. Through a series of complex chemical reactions these pollutants can be converted into acids, which may return to earth as components of either rain or snow. This atmospheric deposition, more commonly known as acid rain, may have severe ecological impacts on widespread areas of the environment.

9.2 Health and Welfare Effects

While direct health effects from acid rain have not been documented there are numerous indirect effects which could have a definite effect on mankind. Atmospheric deposition is known to leach heavy metals such as mercury from rocks causing possible contamination of water supplies. Hundreds of lakes in North America and Scandanavia have become so acidic that they can no longer support fish life. The rain falling on forests and other non-farmlands could, in time, cause extensive changes in the soil chemistry. There is not enough information yet to make it possible to say exactly what the results might be, but there is no reason to think the changes will be beneficial.

9.3 Standards

There are no standards in effect or proposed for atmospheric deposition. The only permanent solution to the acid rain problem is to keep the acid levels low. The only practical way of achieving this is by reducing emissions at their sources.

9.4 Monitoring

During 1983 there were four sites collecting data on atmospheric deposition. Those four sites included two Bureau maintained sites in Bridgton and Acadia National Park, a University of Maine maintained site in Greenville and a National Weather Service maintained site in Caribou. The samples from these four sites are normally collected every Tuesday morning at 9:00 a.m.. Consequently, the samples are not necessarily a single storm event but are more likely to be a composite of all storm events during the previous week. The samples, if there was a signficant storm, are used for field measurements of pH and conductivity and are then packaged up for shipment to the National Atmospheric Deposition Program central laboratory in Illinois. In the central laboratory they are also tested for pH and conductivity as well as additional components. Table 9-1 is a summary of the measurements taken at the central laboratory in Illinois from the DEP operated sites for the year 1983. The sulfate deposition figures were corrected for marine aerosol contribution.

TABLE 9 - 1

1983 ATMOSPHERIC DEPOSITION DATA SUMMARY

SITE	ADDRESS	PH			DEPOSITION (Kg/ha)	
		MAXIMUM	MINIMUM	MEAN*	SO_4	NO_3
DOWNEAST AIR QUALITY CONTROL REGION (109)						
Acadia National Park	McFarland Hill Ranger Station	5.9	3.7	4.7	22.2	10.3
METROPOLITAN PORTLAND AIR QUALITY CONTROL REGION (110)						
Bridgton	Upper Ridge Road	6.3	3.8	4.7	16.0	8.0

*Volume weighted mean.

10. HYDROCARBONS (HC)

10.1 Description and Sources

Hydrocarbons are a class of compounds containing carbon and hydrogen in various combinations. They are found especially in petroleum, natural gas and coal. Some are gaseous, some liquid and some are solid. There are in fact over a thousand hydrocarbon compounds. Many of the polluting hydrocarbons are discharged into the air by incomplete combustion of organic materials. A major source of this kind of hydrocarbon emission is the burning of gasoline in automobiles. Other major contributors are organic solvent evaporation, industrial processes, solid waste disposal and fuel combustion in stationary sources. The control of hydrocarbon emissions are accomplished by combustion process optimization, recovery by mass transfer principles, restriction of evaporative loss and process material and fuel substitution.

10.2 Health and Welfare Effects

Hydrocarbon air pollutants enter into and promote the formation of photochemical smog (ozone) and thus contribute to the development of eye irritation and respiratory tract problems. By themselves, hydrocarbons may induce adverse health effects, although there is relatively little quantitative data to relate individual hydrocarbons to the risk of human disease.

10.3 Standards

The present State and Federal Standard for non-methane hydrocarbons is a three hour average concentration of 160 ug/m^3.

10.4 Monitoring

Hydrocarbons were monitored at only one site in the State during 1983. This monitoring was conducted as part of the ozone program operated in Portland during the ozone season. However, insufficient data was collected during the summer to summarize in a meaningful form.